

The Art of Surprise



Dr. Brian Pierce
Deputy Director
Information Innovation Office

If ignorant both of your enemy and yourself,
you are certain in every battle to be in peril

OCTOBER 4, 1957

19:28:34 UTC



Approved for Public Release, Distribution Unlimited.

STRATEGIC SURPRISE



February 7, 1958
NUMBER 5105.15

Department of Defense Directive

SUBJECT Department of Defense Advanced Research Projects Agency

I. PURPOSE

The purpose of this directive is to provide within the Department of Defense an agency for the direction and performance of certain advanced research and development projects.

II. RESPONSIBILITY AND AUTHORITY

A. Establishment

In accordance with the provisions of the National Security Act of 1947, as amended, and Reorganization Plan No. 6 of 1953, there is established in the Office of the Secretary of Defense the Department of Defense Advanced Research Projects Agency. The Agency will be under the direction of the Director of Advanced Research Projects.

B. Responsibility

The Agency shall be responsible for the direction or performance of such advanced projects in the field of research and development as the Secretary of Defense shall, from time to time, designate by individual project or by category.

C. Authority

Subject to the direction and control of the Director:

1. The Agency is authorized to direct such research and development projects being performed within the Department of Defense as the Secretary of Defense may designate.
2. The Agency is authorized to arrange for the performance of research and development work by other agencies of Government, including the military departments, as may be necessary to accomplish its mission in relation to projects assigned.

3. The Agency is authorized to enter into contracts and agreements with individuals, private business entities, educational, research or scientific institutions including federal or state institutions.
4. The Agency is authorized to acquire or construct such research, development and test facilities and equipment as may be approved by the Secretary of Defense, in accordance with applicable statutes. However, existing facilities of the Department of Defense shall be utilized to the maximum extent practicable.

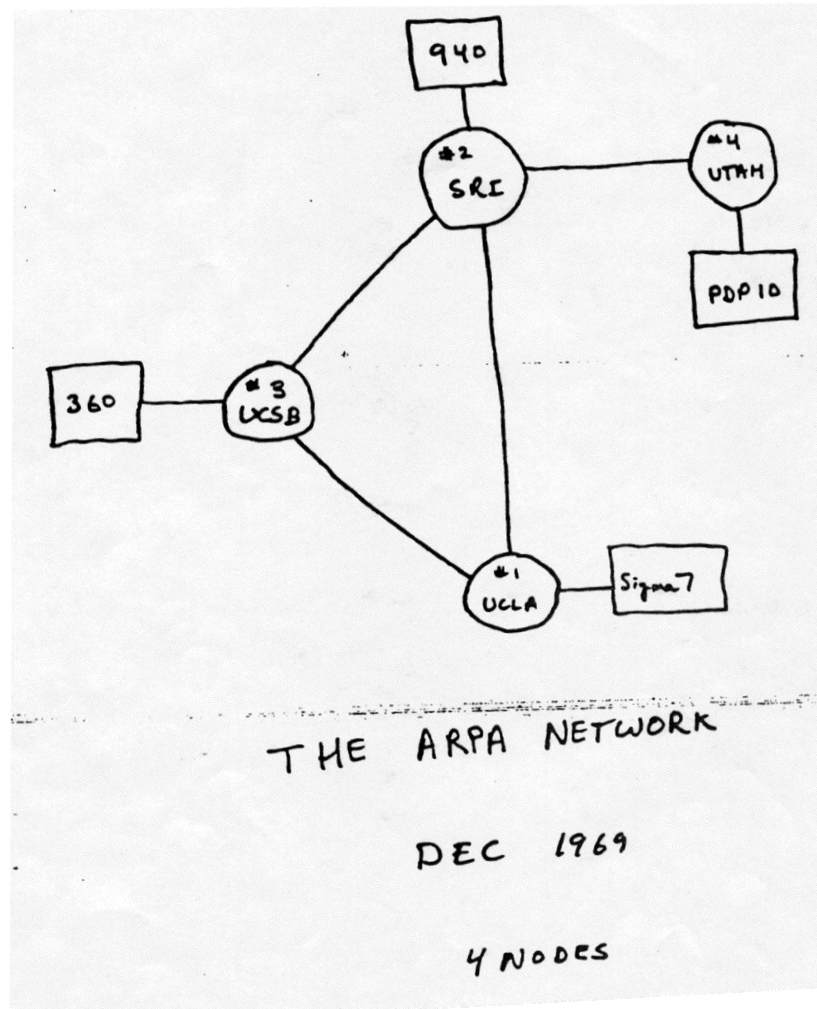
III. ORGANIZATION

- A. The Director of Advanced Research Projects shall report to the Secretary of Defense.
- B. The Department of Defense Advanced Research Projects Agency shall be provided such personnel and administrative support as may be approved by the Secretary of Defense.
- C. Other officers and agencies of the Office of the Secretary of Defense within their respective areas of responsibility shall provide support to the Director of the Advanced Research Projects Agency as may be necessary for him to carry out his assigned functions.

IV. EFFECTIVE DATE

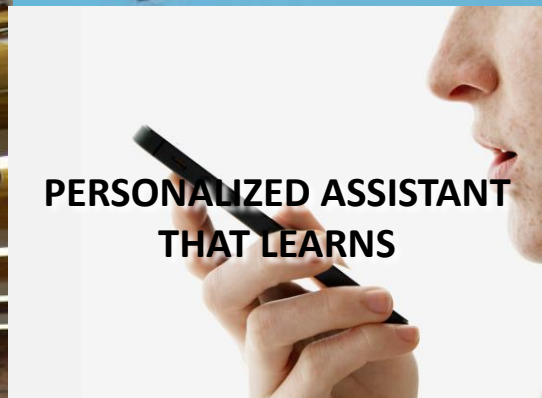
This directive is effective immediately.

James D. Terry



THE INTERNET 1969

DARPA History



Quickness is the essence

430 msec









Plan X



High Assurance Cyber Military Systems



Use the extraordinary to win

What it takes to end an
AIDS epidemic p. 226

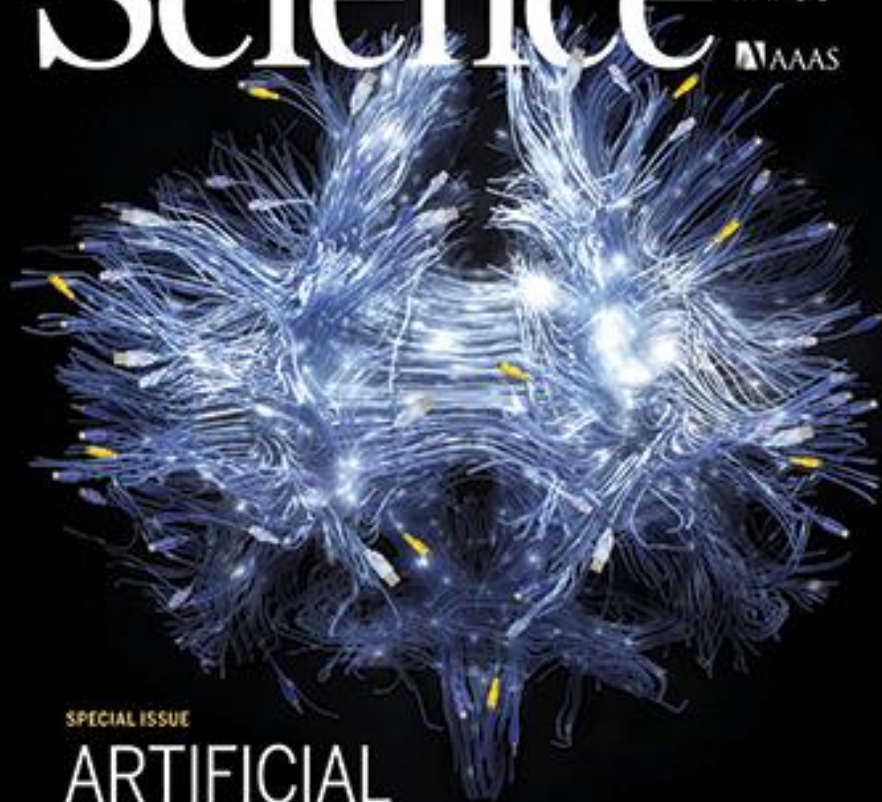
Polar bears suffer through
lean summers p. 288

Sperm produced in ovary
of mutant fish p. 328

Science

\$10
17 JULY 2015
science.org

AAAS



SPECIAL ISSUE

ARTIFICIAL INTELLIGENCE

DARPA Grand Challenges 2004 – 2007

Grand Challenge
2004



Grand Challenge
2005



Urban Challenge
2007



Today...



Probabilistic Programming for Advancing Machine Learning

Tools to program without being an expert



Lane finding algorithm

Baseline:

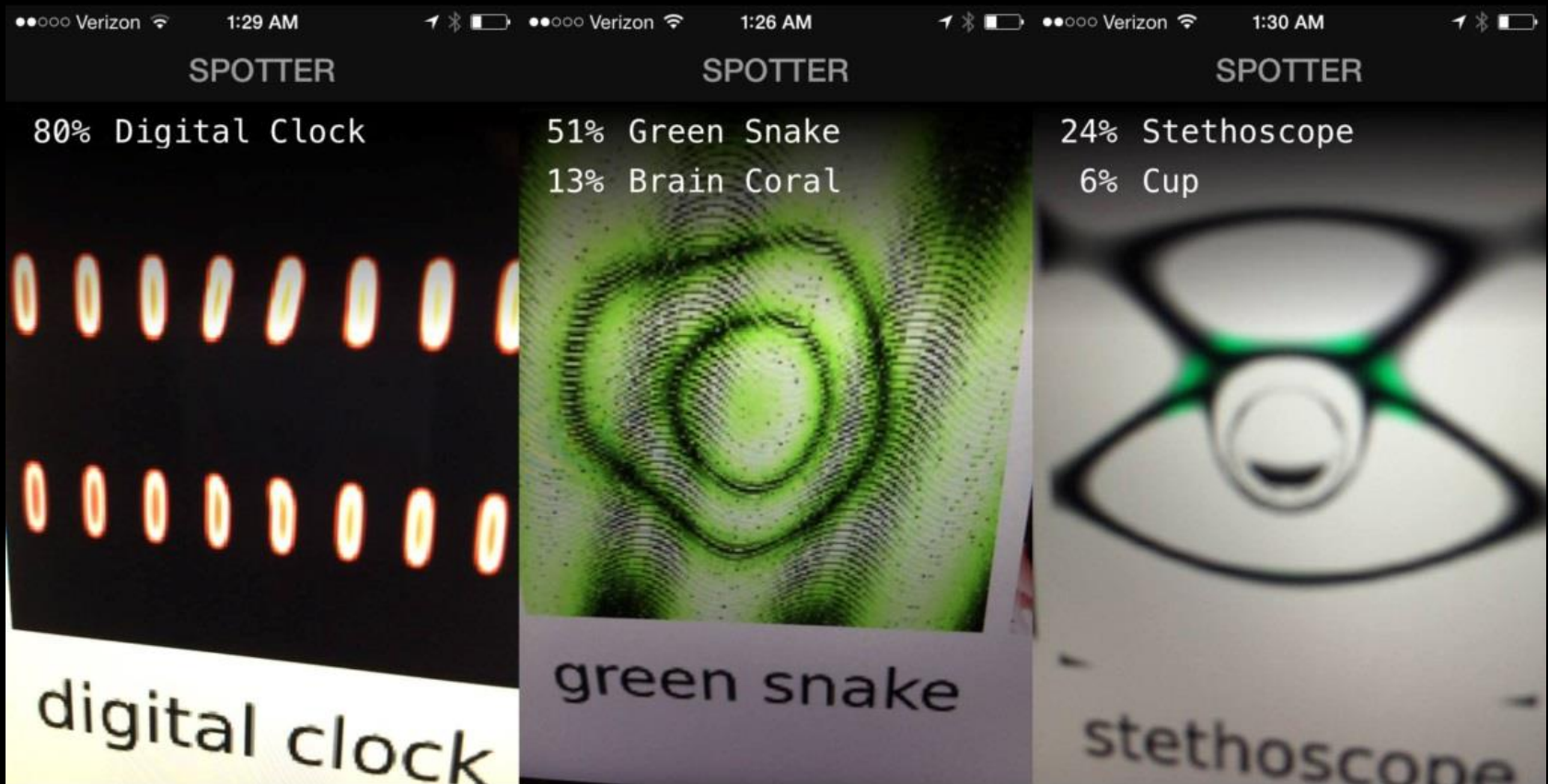
10,000 lines of code, C++

Using PPAML:

Model: ~20 lines of code,

Library: ~100 lines of code (model-specific), plus 10% more accurate

Explainable AI



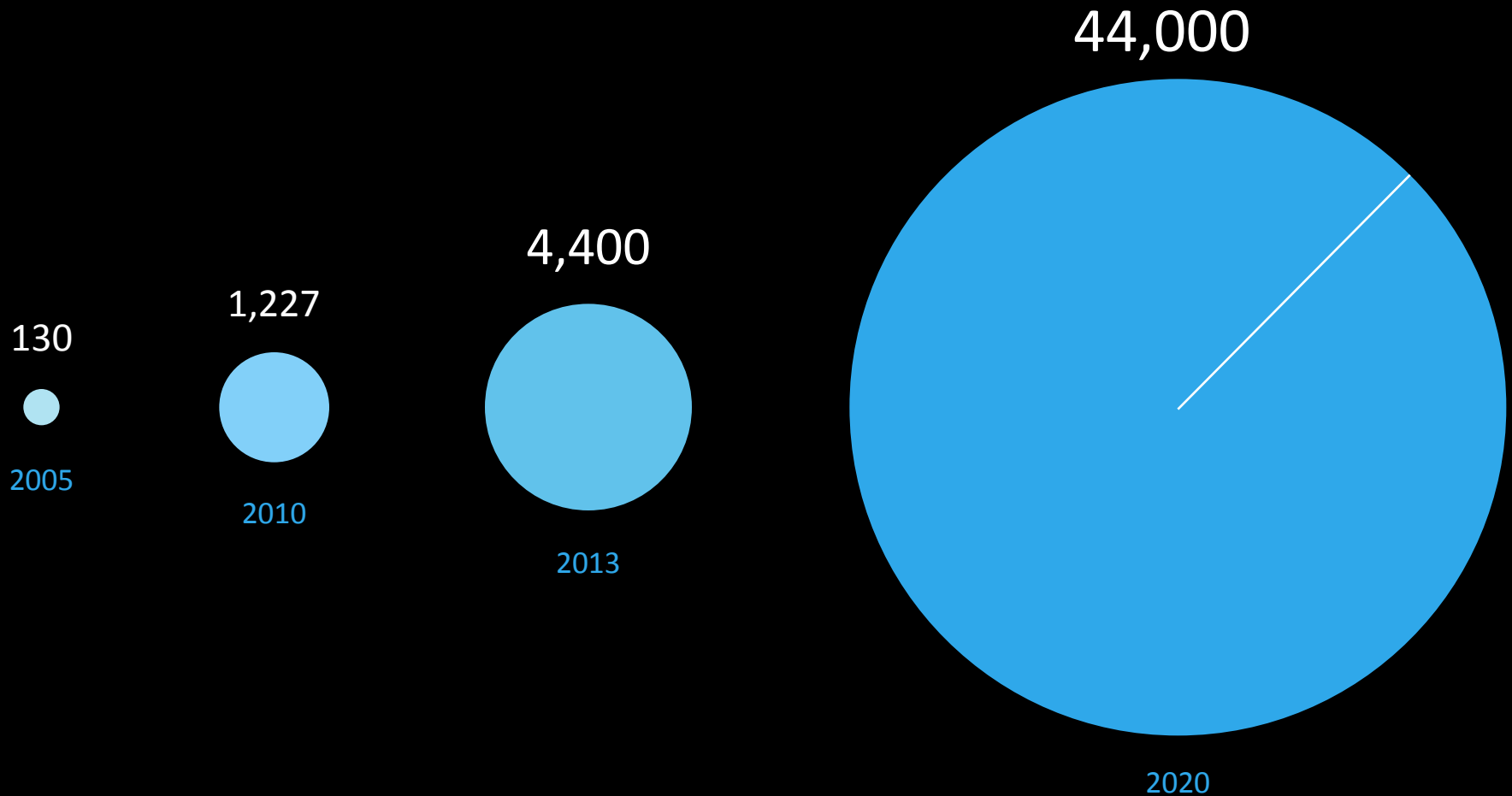
http://devblogs.nvidia.com/parallelforall/wp-content/uploads/2015/08/Clune_Fig4.jpg

Communicating with Computers



With many calculations,
one can win

Data is Exploding



Quantity of Global Digital Data, in Exabytes

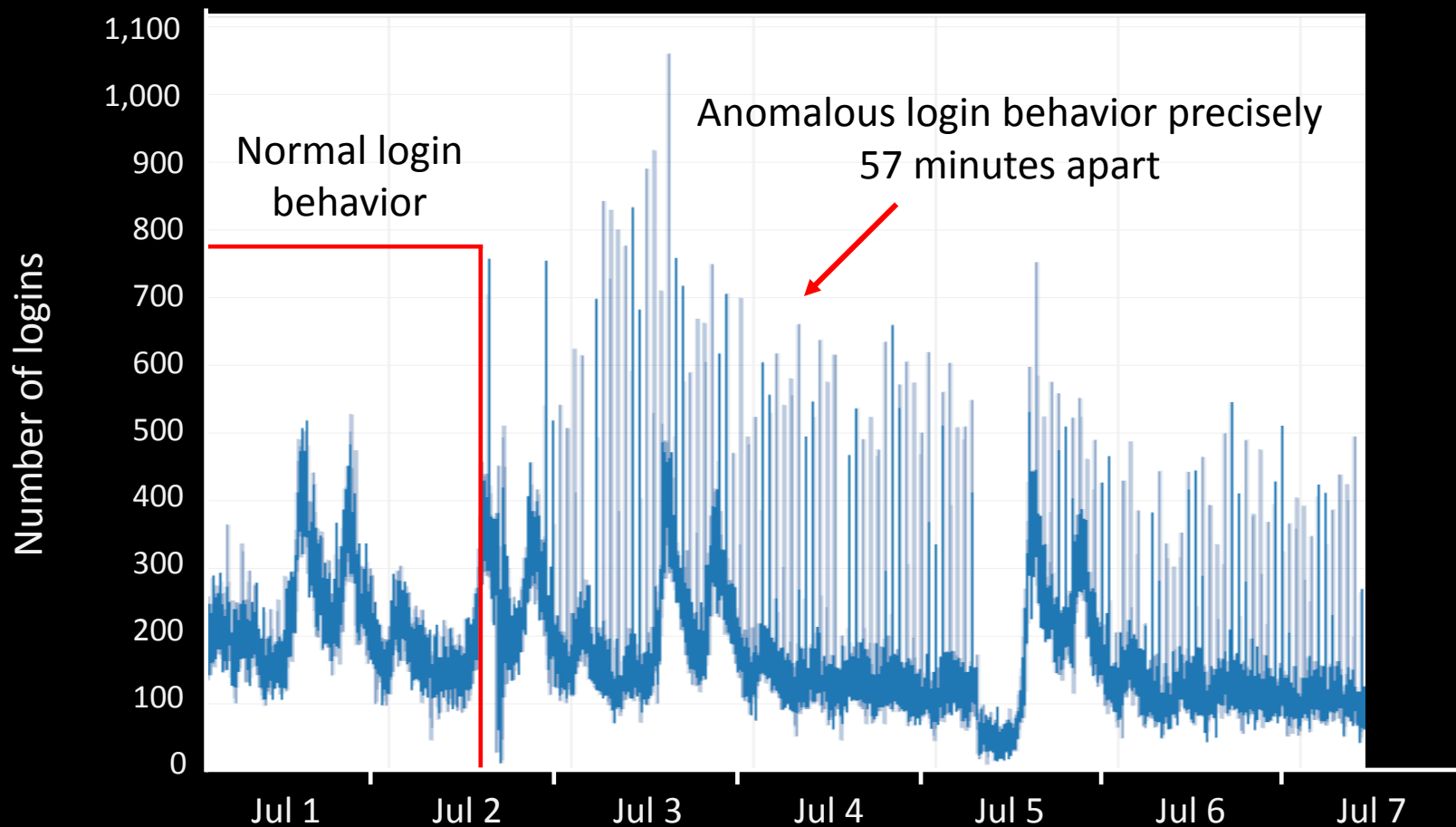


EXABYTE = 1,000,000,000,000,000 BYTES

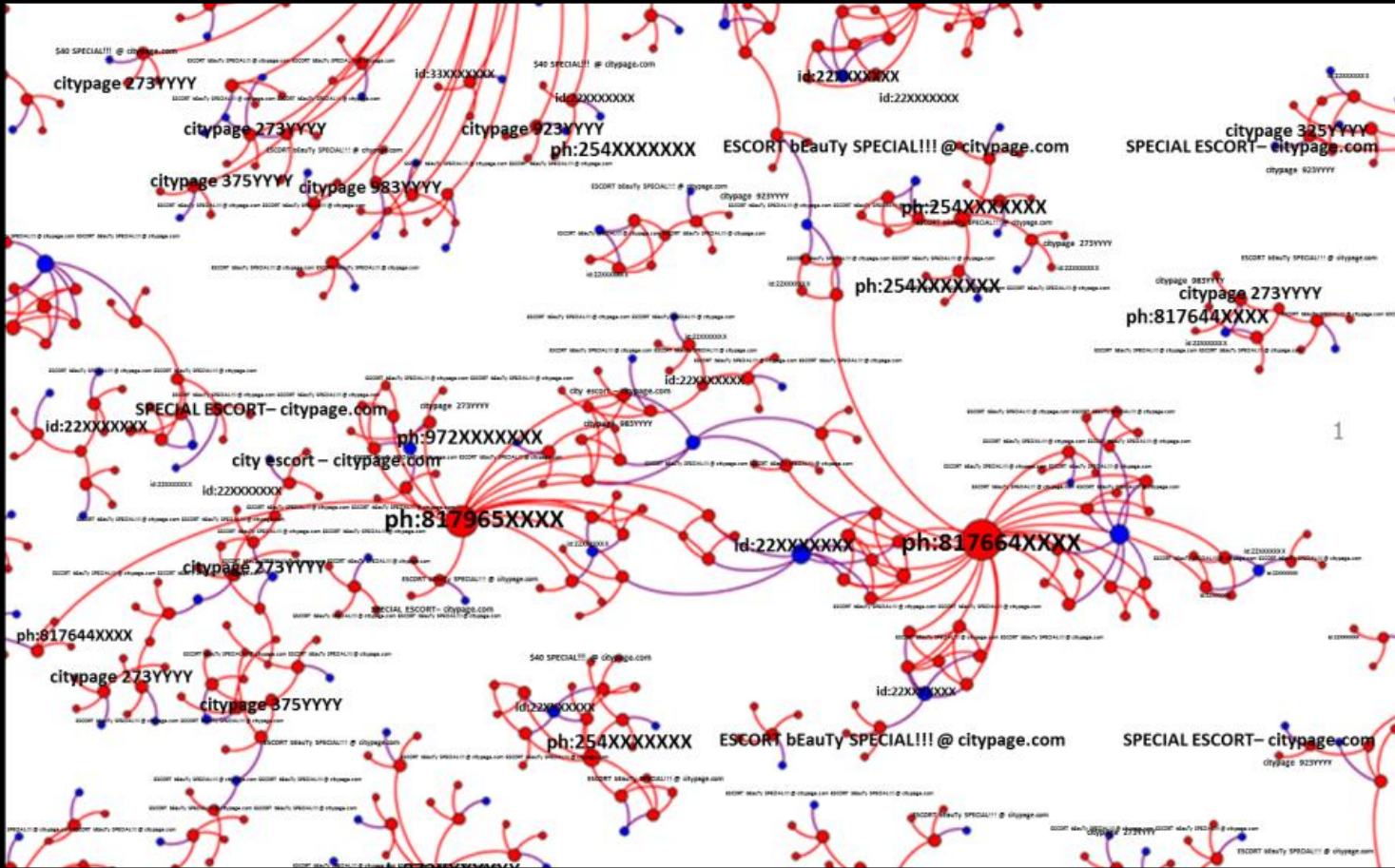
Network Defense

Detecting Network Infiltration:

Single unauthorized IP address hidden in 87.9 billion network logs

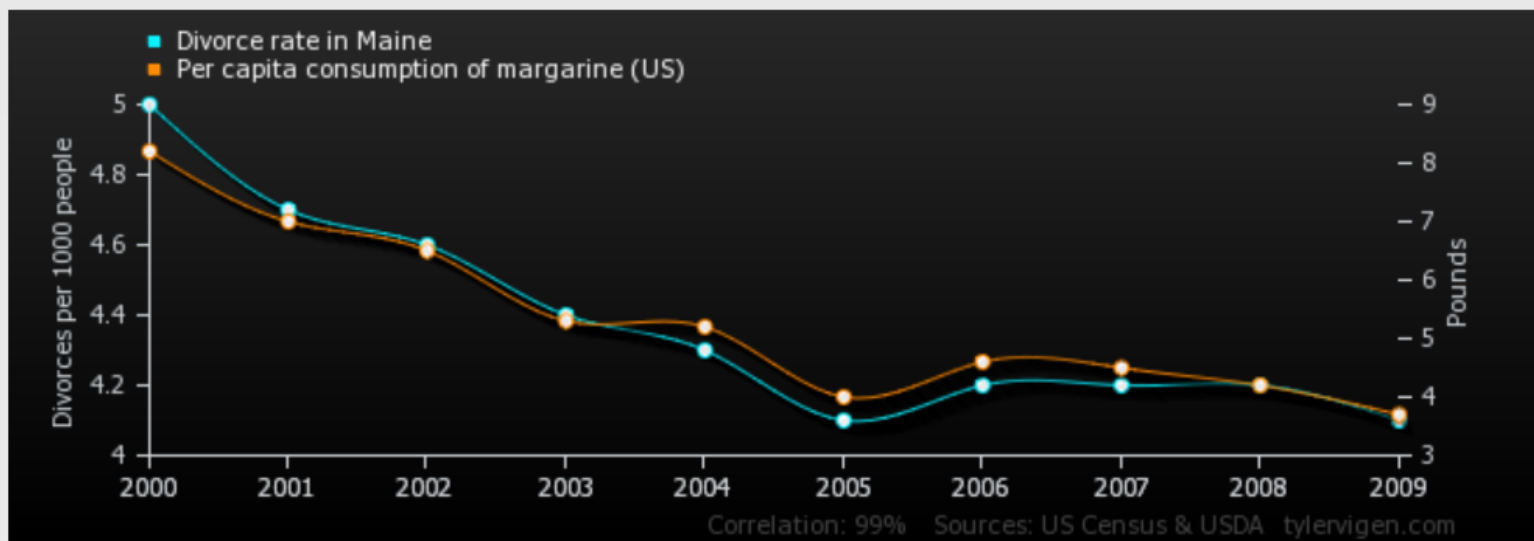


Memex



Correlations can be misleading

Divorce rate in Maine correlates with Per capita consumption of margarine (US)



Correlation: 0.992558

Big Mechanism



If you know the enemy and know
yourself, you need not fear the result
of a hundred battles





The art of surprise

Open source code for the community

DARPA - Open Catalog x

opencatalog.darpa.mil

  **OPEN CATALOG**

Search

Welcome to the DARPA Open Catalog, which contains a curated list of DARPA-sponsored software and peer-reviewed publications. DARPA sponsors fundamental and applied research in a variety of areas that may lead to experimental results and reusable technology designed to benefit multiple government domains.

Current Catalog Programs:

DARPA Program	Office	Description
AA	I2O	The Active Authentication (AA) program seeks to develop novel ways of validating the identity of computer users by focusing on the unique aspects of individuals through software-based biometrics. Biometrics are defined as the characteristics used to recognize individuals based on one or more intrinsic physical or behavioral traits. This program is focused on behavioral biometrics.
ADAMS	I2O	The Anomaly Detection at Multiple Scales (ADAMS) program seeks to create, adapt and apply technology to anomaly characterization and detection in massive data sets. Anomalies in data cue the collection of additional, actionable information in a wide variety of real world contexts.
APAC	I2O	The Automated Program Analysis for Cybersecurity (APAC) program aims to address the challenge of timely and robust security validation of mobile apps by first defining security properties to be measured against and then developing automated tools to perform the measuring. APAC draws heavily from the field of formal-methods program analysis (theorem proving, logic and machine proofing) to keep malicious code out of DoD Android-based application marketplaces. APAC seeks to apply recent research breakthroughs in this field in an attempt to scale DoD's program analysis capability to a level never before achieved with an automated solution.
BET	I2O	The objective of the Binary Executable Transforms (BET) program is to produce revolutionary technologies for analyzing executable binaries to identify and extract executable components. Executable components are defined as a fully encapsulated set of subroutines, data structures, objects and global variables that accomplish a particular function, along with metadata documenting the component's arguments and any system libraries used. Specifically, BET performers are conducting innovative research in: <ul style="list-style-type: none">• Automatically analyzing binaries and identifying functional components.• Automatically slicing and extracting identified functionality into reusable components with well-defined inputs and outputs.• Combining static and dynamic binary analysis to improve understanding of binary executables.• Exploring formal verification methods to prove functional component properties.• Developing intermediate representation language to support program slicing.• Developing technologies to enable exploration and research for the BET program.

Windows taskbar: Windows, Outlook, Inbox - ..., Chrome, DARPA ..., Edge, Downloads, awards ..., PowerPoint 2016 07..., PowerPoint 2016 07..., Excel, Word, File Explorer, Task Manager, Network, Volume, 6:09 PM 7/31/2016

